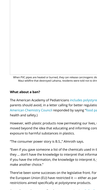

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These Two Toxic Plastics Should Be Banned. Here's Why.

Anti-plastic campaigners, who have achieved limited success in passing bans based on the toxic health effects of plastics that contain known carcinogens and hormone-disrupting chemicals, say two of the most toxic types of plastic — polystyrene and polyvinyl chloride, or PVC, should be completely banned.

By Mongabay

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By Alden Wicker

- Anti-plastic campaigners have achieved limited initial success in passing bans based on the toxic health effects of some plastic types, especially those that contain known carcinogens and hormone-disrupting chemicals.
- Some activists say that two of the most toxic types of plastic, polystyrene and polyvinyl chloride (PVC) should be completely banned. But so far, bans on polystyrene in Zimbabwe, Scotland and elsewhere have focused only on certain products, such as takeout containers.
- PVC is used in medical devices and children's products, despite its well-known toxicity. PVC and polystyrene are both used in consumer construction, where they can leach chemicals into water or home air, or release particles into the wider environment.
- The U.S. Environmental Protection Agency (EPA) is reviewing vinyl chloride, PVC's main ingredient and a known carcinogen, but the outcome won't be known for several years and may only affect U.S. production, not imported products made of PVC. More than 60 nations want a ban on "problematic plastics" by the global plastics treaty now being negotiated.

In 2010, when Zimbabwe's new Environmental Management Agency (EMA) was less than 8 years old, it looked at high-priority environmental issues it should tackle. And it identified polystyrene takeout containers.

Some know this type of plastic by its brand name Styrofoam. Zimbabweans call their takeout containers kaylites. Regardless of the name, just like all over the world, this lightweight plastic was ending up in Zimbabwe's water bodies, where it broke up into tiny, impossible-to-clean-up, bits.

But eradicating polystyrene kaylites proved no easy task: First, in 2012, the EMA issued a statutory instrument (a sort of executive order), banning polystyrene takeout containers, but that rule had no teeth.

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In 2016, it rolled out a complete ban on the manufacture, importation and distribution of polystyrene kaylites. Restaurants and manufacturers managed to delay enforcement until 2017 when the government put its foot down. Violators now face criminal charges.

What finally persuaded officials to crack down on foam takeout containers? More than visible floating trash, it was polystyrene's health effects.

A 2017 study out of the University of Zimbabwe found that styrene, a known carcinogen, can migrate out of containers and into food. The higher the temperature, the more the migration, but even when stored in the fridge, oily foods soak up styrene.

"That then triggered the rapid implementation by the government," says Archieford Chemhere, a climate justice specialist with the Zimbabwean nongovernmental organization (NGO) Action Aid.

Even though restaurants had a huge stock of foam containers imported from China, many consumers started refusing them. "Within a year, polystyrene kaylites were rarely seen in food outlets, and their presence today is negligible," Chemhere adds.

Zimbabwe was one of the first countries to ban polystyrene products, and — along with Belize, Scotland and a half-dozen island nations, including the Seychelles, Antigua and Barbuda — it is on the vanguard of a new movement to get plastics out of the environment and the human body based not solely on the litter eyesore or the tragedy of dead marine life and sea birds.

Instead, this movement is based on a rather more personal (but politically effective) justification: Science is increasingly showing that plastics are making us sick.

Polystyrene waste piles up outside a fish market in Tokyo. Image credit: Jonas Gerlach/Unsplash

No such thing as 'pure' plastic

Many researchers and activists agree: Hazardous chemicals are a danger inherent in many plastics — though a peril whose full parameters are still unknown.

"There's no such thing as a pure plastic polymer. That doesn't exist," says Bethanie Carney Almroth, professor of ecotoxicology and environmental science at the University of Gothenburg, Sweden.

According to research out of Norway, due to be published this month, there are around 16,000 identifiable chemicals used in plastic. A quarter of them are classified as hazardous in some way, while almost 11,000 haven't been assessed for safety at all.

Some of these chemicals are core ingredients to the polymerization process, while others are additives that give various plastic products their unique qualities (strength, flexibility, color and more).

Some are contaminants of the oil and natural gas that are the raw materials for making plastics. Some are accidental byproducts of production. Some are unreacted monomers that stay in the final product.

"All plastics are toxic, and certainly some are worse than others," says Michael Schade, director of consumer-focused campaigns at the U.S. nonprofit advocacy organization Toxic-Free Future.

His organization has a long list of problematic plastics, including polycarbonate (a hard, clear plastic once used in baby bottles that often contains hormone-disrupting bisphenols like BPA) and acrylonitrile butadiene styrene.

But experts often point to two types of plastic that are so toxic to produce, use and dispose of, they shouldn't even be on the market: PVC and polystyrene.

Both should see an "immediate freeze and phase-down" of production, says the U.K.'s Environmental Investigation Agency, an NGO. More than 60 nations want an outright ban on "problematic plastics" by the global plastics treaty now being negotiated.

A woman throws out a styrofoam cup in Mexico City. Image credit: Julio Lopez/Unsplash

PVC: 'No Safe Way'

PVC is the world's third-most-produced plastic after polyethylene and polypropylene. It's found in shower curtains, raincoats, kid's jelly shoes, toys, inexpensive "vegan" imitation leather and ubiquitous blister packaging. By far its largest use, however, is in construction, in things such as PVC pipes and vinyl siding.

Advocates and researchers say we would be better off without it. "From production to use to disposal, PVC is an environmental nightmare," Schade says.

"Its use poses exposure risks for consumers, especially vulnerable populations like pregnant women and young children … because it is often filled with a witch's brew of toxic additives — everything from phthalates to flame retardants to organotins and Bisphenol A."

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According to a report by the U.S. advocacy organization Beyond Plastics, "Independent researchers have documented as many as 50 different toxic chemicals released by PVC and CPVC pipes into drinking water," including vinyl chloride and hormone-disrupting chemicals such as organotins and phthalates.

When wildfires tear through communities, hot and burned PVC pipes contaminate water making it undrinkable even after being purified.

Phthalates, potent endocrine disruptors, have been linked to genital birth defects, infertility, behavior problems in children and other reproductive and developmental harms.

An estimated 90% of all phthalates are used to soften vinyl plastic. "Up to 40% by weight of a plastic product can be phthalates," says Almroth. "They can easily leach out."

Vinyl chloride — the VC in PVC — is linked to an increased risk of liver, brain and lung cancers, plus lymphoma and leukemia, according to the National Institutes of Health.

Cheap pleather is often made of PVC, which contains the carcinogen vinyl chloride and phthalates, endocrine disruptors that can easily migrate out of the material, especially when the wearer sweats in it. Image credit: prananta haroun/Unsplash

"What's wild is we have known that vinyl chloride is a human carcinogen since 1974. That's almost 50 years ago," says Melissa Valliant, communications director at Beyond Plastics. "There is no safe exposure risk to vinyl chloride. And yet it's in so many of the things that we touch every day."

The vinyl industry has gotten better at reducing the amount of vinyl chloride that off-gases or leaches out of vinyl. But that doesn't solve toxic problems associated with vinyl production.

Though the majority of PVC comes from China, the U.S. is still manufacturing PVC and vinyl chloride, mainly in low-income communities of color in southern states, where its contaminants pollute the air and groundwater.

The Vinyl Institute, which represents PVC and vinyl manufacturers, did not respond to Mongabay's questions.

It was vinyl chloride that was carried by the train that derailed in East Palestine, Ohio, in February 2023.

Beyond Plastics released a documentary in October about the effects of that derailment and the decision to vent and burn off the vinyl chloride, which can create highly toxic dioxins — the same chemical used in Agent Orange, the Vietnam War-era defoliant, and one found beneath Love Canal, New York, in the 1970s, a tragedy that prompted passage of the U.S. Superfund law.

"The community there is still struggling with this," Valliant says of East Palestine. "Residents reported being sick themselves, pets being sick, there were thousands of fish turning up dead in the waterways. And these train derailments aren't unusual."

Finally, the disposal of PVC is also problematic. It's not recyclable. When vinyl is landfilled, its additives can contaminate groundwater. When it's incinerated, dioxins, again, are created and emitted.

A report by Beyond Plastics said that "as many as 50 different toxic chemicals" are released by PVC and CPVC pipes into drinking water. Image credit: EJ Strat/Unsplash

Polystyrene: The 'most hated' plastic

Polystyrene makes up only about 6% of global plastic production, and according to the Expanded Polystyrene Industry Alliance (EPS-IA), a North American trade association for the expanded polystyrene industry, the foam kind we most easily recognize makes up a subset of that.

However, polystyrene inspires a lot of strong feelings from environmentalists. "It's one of my most hated plastics," Valliant says.

If you've ever tried wrangling a box full of foam peanuts into a trash bag, you know how easily they spill. As the Zimbabweans noticed, once in the environment, this plastic rapidly breaks into smaller and smaller pieces, becoming microplastics that can't be cleaned up the way a tossed water bottle can.

Because it's used in construction, polystyrene often contains toxic flame retardants. At building sites, foam blocks are sawn to fit inside walls, creating foam particulate "snow" that can blow away.

According to one University of Toronto student project studying foam litter in Lake Ontario, over 50% comes from construction sites. Betsy Bowers, Executive Director of the Expanded Polystyrene Industry Alliance, says responsible protocols on construction sites require "the recapture of airborne particles."

Like other plastics, polystyrene contains many toxic additives. Recent studies found that polystyrene particles could be toxic to human kidney and liver cells and aquatic invertebrates.

Styrene itself is the major concern for foam, however. It's a probable human carcinogen and can leach out of food containers, especially when foam packaging has hot food inside. Polystyrene remains common throughout much of the world as coffee cup lids, stir sticks, spoons, cups, bowls and takeout containers.

Bowers of EPS-IA says:

> "The studies we've seen to date indicate temperatures above 200°F (95°C) are needed [for leaching], and even then, do not exceed the 'No Significant Risk Level' (NSRL) determined by WHO [World Health Organization], California Prop 65, or The National Institute for Occupational Safety and Health (NIOSH)."

At construction sites, foam blocks like this are sawn to fit inside walls, creating foam "snow" that can blow away. According to one study of foam litter in Lake Ontario, more than 50% of it comes from construction sites. Image credit: Phyrexian/Wikimedia Commons

When PVC pipes are heated or burned, they can release carcinogenic dioxins and other hazardous chemicals. After the 2023 Maui wildfire that destroyed Lahaina, residents were told not to drink the water, even after filtration. Image credit: State Farm/flickr

What about a ban?

The American Academy of Pediatricians includes polystyrene and PVC in its list of plastics that parents should avoid, in a letter calling for better regulation of food packaging and additives. (The American Chemistry Council responded by saying "food packaging in the U.S. is best in class" for health and safety.)

However, with plastic products now permeating our lives, many environmental advocates have moved beyond the idea that educating and informing consumers is sufficient for them to avoid exposure to harmful substances in plastics.

"The consumer power story is B.S.," Almroth says.

"Even if you gave someone a list of the chemicals used in the production of expanded polystyrene, they … don't have the knowledge to interpret that information. And then the third thing you need, if you have the information, the knowledge to interpret it, you need a wallet that allows you to make another choice."

There've been some successes on the legislative front. For polystyrene, dozens of countries and the European Union (EU) have restricted it — either as part of a large single-use plastic ban, or as restrictions aimed specifically at polystyrene products.

According to the nonprofit advocacy organization Safer States, nine U.S. states and Washington, D.C., have passed legislation that limits polystyrene use, and in 2023, 16 additional states introduced policies on polystyrene.

"What we really need is a national ban on this, but it takes … state work first to motivate lawmakers on the federal level," Valliant says.

PVC is a newer issue. While the U.S. Food and Drug Administration prohibits the use of PVC liquor bottles, it's still legal to use in general food and personal care packaging.

However, according to Safer States, six states introduced policies in 2023 that would restrict PVC in packaging.

Beyond Plastics has a petition on its site asking the EPA to ban vinyl chloride. On Dec. 14, 2023, the EPA announced that it would be initiating the federal chemical review process of vinyl chloride. Ned Monroe, president and CEO of the Vinyl Institute, said in a statement:

> "Vinyl Institute and our members are fully prepared to work with the EPA during both prioritization and risk evaluation of vinyl chloride. … We believe this risk evaluation will further assure that the production of vinyl chloride and use of PVC products are safe."

The National Guard prepares to enter part of East Palestine, Ohio, four days after a train derailed and cars full of vinyl chloride were vented and burned, potentially creating dioxins. Many residents reported that they or their pets were sick, and dead fish turned up in the nearby river. Vinyl chloride is used to make PVC. Image credit: National Guard/flickr

PVC producers had previously said there weren't good replacements for all the current uses of PVC plastic.

But the Healthy Building Network provides an extensive list of alternatives for construction, including copper piping; sustainably harvested wood siding; bamboo, wood or linoleum flooring (made from linseed oil); and fiberglass or aluminum windows.

As for kids' toys and apparel, there are much safer plastics to use. "Beyond Plastics and most other environmental organizations are not looking to ban all plastic outright — we're focused on the most unnecessary uses," Valliant clarifies by email.

On the packaging issue, some corporations aren't waiting for a ban. In 2022, a group of 100 major consumer companies including Walmart, Target, Unilever, Dr. Pepper and General Mills, made a voluntary pact to stop using PVC in their plastic packaging by 2025.

What about replacements for polystyrene? In Zimbabwe as well as Hawaii, after a polystyrene takeout container ban came into force, some restaurants switched to paper or cardboard takeout boxes. But most just switched to hard plastic containers. Which is better, campaigners tell Mongabay, but not by much.

In shipping, foam peanuts have sometimes been replaced by starch ones. But the more common choice is now air-filled plastic pillows. "They're still problematic," Valliant says. "The amount of unnecessary plastic packaging that comes through e-commerce is mind-blowing."

A boat tows balls of salvaged polystyrene in fishnets off Xinbu Island, on the north coast of Hainan Province, China. China is the world's largest producer of polystyrene. It banned expanded polystyrene takeout/takeaway containers and tableware in 1999 but rescinded the ban in 2013 under pressure from the industry. Image credit: Anna Frodesiak/ Wikimedia Commons

Toward a global treaty

It's clear that global public health concerns won't be fully met by simply replacing the most toxic plastics. There also needs to be a reduction in single-use and excessive plastic packaging, something more than 60 nations in the High Ambition Coalition are pushing for in the U.N. plastics treaty process, even as resistance builds among fossil fuel and plastics producing nations such as China, Russia, Saudi Arabia, Iran and the U.S. to a lesser degree.

Schade, Valliant and Almroth all speak about overhauling the world economic system and moving from single-use to multi-use.

Valliant cites DeliverZero in New York and reCIRCLE in Switzerland as two companies pioneering reusable networks based on deposits and convenient drop-off sites for used products.

The Plastics Industry Association did not respond to Mongabay's questions. But in a statement regarding Ohio's single-use plastics law, it said:

> "The plastics industry wants to keep plastic out of the environment and in the economy; we are committed to eliminating waste, but a ban like this is potentially worse for the environment and increases costs for business owners and consumers."

Almroth would also like to see the supply of toxic plastic materials limited, instead of regulation going product-by-consumer-product.

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"The private sector and the public sector have invested large amounts of money in extractive practices, in mining, in drilling, in fracking. When markets shift and products are banned, they create new markets."

This tension between material and product regulation came to the fore in the latest round of U.N.-led negotiations for an international plastics treaty.

Oil-producing countries pushed for the treaty to focus mostly on plastic waste — which would foist responsibility off on consumer product companies and governments and away from fossil fuel and petrochemical companies, protecting their bottom line.

Though many countries at the last plastic summit were talking about the health threats of plastics, "Countries like Saudi Arabia and China do not want that responsibility. Their idea is, 'How do you stop 'leakage' of plastic into the ocean?' which is the most remedial thinking," says Bjorn Beeler, the California-based general manager and international coordinator at IPEN, the International Pollutants Elimination Network

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When polystyrene like this old cup gets into the environment, it breaks up quickly into little pieces, eventually fragmenting into many thousands of microplastic particles that are impossible to clean up using current technology. Image credit: Brian Yurasits/Unsplash

Many negotiating nations and activists want a treaty that will strictly regulate plastics from cradle to grave, rather than dealing only with disposal and recycling.

They argue that a narrowly focused accord would mirror the deeply flawed policies built into the 2015 Paris Climate Agreement, which until this year failed to propose a phasedown of fossil fuel production while hyper-focusing only on voluntary emissions reductions.

“When you look at bans, you’d have to look at the Stockholm Convention,” Beeler says.

The Stockholm Convention already bans a number of highly hazardous chemicals and could be updated to include endocrine disruptors such as phthalates and BPA, or hazardous plastic ingredients such as vinyl chloride and styrene.

Analysts agree an internationally binding ban on the production of the most toxic plastics would work far better than patchwork regulations at the national or state level.

Especially since the global economy is now seeing plastics made in China, the U.S., the EU and elsewhere polluting Indonesian beaches, river headwaters, deepest ocean trenches, clouds atop Mount Fuji, Antarctic snows, the bellies of Nepal’s rhinos and even inside the brain.

Despite this, a ban could be problematic: For the holidays, Valliant and her husband ordered oysters from the state of Maine, which has a polystyrene ban. The seafood arrived in polystyrene. She’s been meaning to look into how that could happen.

“We’re literally shucking these,” she says. “And as we’re serving them, there’s little tiny beads of styrofoam on the oysters. And I’m just like, ugh, we need to work on this.”

Originally published by Mongabay.

Alden Wicker is a solutions-oriented investigative journalist in sustainability and health, and the founder of EcoCult.

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the views of Children's Health Defense.

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Best Newest Oldest

BH387

4 days ago edited

As one who is in real estate and construction, PVC drain piping is going to be with us a long time, and PEX plastic water supply piping has been taking over from copper, because of ease of installation and security, copper being a prime target for thieves, even though they probably make less per hour from such thievery than if they mow people's lawns or shovel their snow.

One would hope biofilms reduce the water pollution from leaching of PVC drain piping, but with drain cleaners, good luck with that. The poisons from the tap water introduced by the plastics can be filtered, but that passes them along to disposal.

It is time to step up on the durable and more biologically friendly alternatives, and make better use of containment and bioremediation. There are already lots of perfectly effective biodegradable packaging alternatives, but people obviously do not want building materials to be degradable, expensive to produce, and/or difficult to install.

Perhaps the better method for building materials would be to go back to more traditional materials, such as galvanized steel water piping, but configured in ways that enable more easy replacement as they inevitably deteriorate, using small sections with unions or other easy to connect and remove fittings and access panels in walls, ceilings and such as a matter of course during construction.

2 0 Reply • Share ›

Wendy

5 days ago

Indeed. As Dr. Mercola says, we need to stop enshrining our food in plastic. It's dangerous and disgusting.

2 0 Reply • Share ›

Mark777

5 days ago

I'm within days of pre-ordering the new battery-operated Blu3 Nomad Mini hookah diving system. Having read an online article that conventional rubber scuba hoses should never be used for hookah diving because it will gradually deteriorate and become toxic, I emailed the manufacturer wanting to know what materials they use in their hoses. Here's the response that I received:

"You can be confident that our hoses are not made of rubber and are completely safe for their intended purpose. Our hoses are manufactured using a non-toxic PVC."

Having read this article about pvc, I now don't know what to believe. Instead of biting down on the mouthpiece I will be buying the OTS Spectrum full face dive mask. Hopefully a full face dive mask will keep my mouth at a distance away from the hose.

Because I care about my health more than the average person, if anybody could provide me with any useful information on whether or not I should proceed with buying this hookah diving system, then I would really like to know what your thoughts are on this. Would I be placing myself at risk by breathing several hours at a time through this hose, or like what the manufacturer says, that it's non-toxic and perfectly safe?

1 0 Reply • Share ›

> **Wendy** → Mark777
>
> 5 days ago
>
> The manufacturer is lying. We just read that PVS is not safe. Ask them to prove it is safe. They will not be able to do so.
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